Problem 1. In the form of formal logic,
(1) $K \vee R \vee Y \vee Z$ (at least one of them are criminals)
(2) $\neg K, \neg R, \neg Z$ (K, R, Z are eliminated)
(3) $\therefore Y$

Problem 2. YES
(1) If neither the first nor the second logician doesn't want beer, they should say "NO".
(2) If the third logician doesn't want beer, the bartender should served two pints of beer.

Problem 3.a. NOT VALID
(0) Let $A = \text{you}, B = \text{the criminal}, C = \text{walks with a slight limp}$
(1) $(A \to C) \wedge (B \to C) \vdash A \to B$

Problem 3.b. VALID
(0) Let $A = \text{able to have class}, B = \text{Shin brought his labtop}$
(0) Let $C = \text{there is a computer in the lecture room}$
(1) $A \to (B \vee C), \neg B, \neg C \vdash \neg A$

Problem 4.a. Prove $P \leftrightarrow \neg Q \vdash \neg P \leftrightarrow Q$
(1) $P \leftrightarrow \neg Q$ (promise)
(2) $(\neg Q \to P) \wedge (P \to \neg Q)$ (biconditional elimination)
(3) $(\neg P \to Q) \wedge (Q \to \neg P)$ (contraposition)
(4) $\neg P \leftrightarrow Q$ (biconditional introduction)

Problem 4.b. Prove $R \to \neg P, Q, Q \to (P \vee \neg S) \vdash S \to \neg R$
(1) $S \to P$
  (1.1) $Q \to (P \vee \neg S)$ (promise)
  (1.2) Q (promise)
  (1.3) $P \vee \neg S$ (conditional elimination)
  (1.4) $S \to P$ (material implication)
(2) $P \to \neg R$
  (2.1) $R \to \neg P$ (promise)
  (2.2) $P \to \neg R$ (contraposition)
(3) $S \to \neg R$ (from 2, 3, hypothetical syllogism)